

PROCEEDINGS
OF THE
CALIFORNIA ACADEMY OF SCIENCES

Fourth Series

VOL. XXIV, No. 1, pp. 1-20, pls. 1-3

MARCH 31, 1942

CONTRIBUTIONS TOWARD A KNOWLEDGE OF THE
INSECT FAUNA OF LOWER CALIFORNIA*

No. 1

INTRODUCTORY ACCOUNT

BY

A. E. MICHELbacher

Agricultural Experiment Station, University of California

AND

E. S. ROSS

Department of Entomology, California Academy of Sciences

THE PENINSULA of Lower California, in spite of its interesting fauna, has been long neglected by collectors of insects. This has probably been due to difficulties encountered in traveling through such a desert region with its barely passable roads. Most of the insect collections have been made in the Cape Region, which is quite readily accessible by boat. In consequence the insect fauna of that area is relatively well-known, whereas the greater part of the peninsula has been scarcely touched by collectors.

The California Academy of Sciences has quite properly been the leader in the biological exploration of Lower California. Unfortunately, however, its large and important collections made between 1888 and 1894 were largely destroyed in the San Francisco earthquake and fire of 1906.

* Printed from the John W. Hendrie Publication Endowment.

Realizing the need for additional collecting on the peninsula, the writers spent two months during the summer of 1938 in an overland tour of the peninsula. The collection obtained seemed sufficiently large to make desirable the publication of the present series of entomological reports. An effort has been made to adopt a uniform style of presentation and to include both published and unpublished records. Thus an attempt will be made to summarize all available information regarding the insects of Lower California and its adjacent islands. In addition the more remote Revillagigedo and Tres Marias Islands have been treated in appendices.

As an introduction to this undertaking a summary of the sources of entomological material upon which the records have been based is presented in chronological order below.

Maps have been included which are designed to indicate all localities from which entomological material has been obtained.

The writers express their appreciation to the following individuals for information used in the preparation of this historical summary: Mr. C. W. Leng, Miss Ella A. Beyer, Prof. G. F. Ferris, Dr. Wm. M. Mann, Dr. E. C. Van Dyke and Mr. F. H. Rindge.

1859-1861, *J. Xantus de Vesey*. Xantus, 1860 (an earlier trip); Horn, 1894: 302; Nelson, 1921:141.

John Xantus was stationed as a tidal observer for more than two years at Cape San Lucas, from April, 1859, to 1861, by the United States Coast Survey. In addition to such duties he collected natural history material for the Smithsonian Institution. Among these collections were many insect specimens. These were perhaps the first Lower California insects to reach the hands of specialists; the Coleoptera, for example, were divided between H. Ulke and J. L. LeConte.

His letters say he visited San José del Cabo, the Sierra Laguna, Todos Santos, La Paz and Magdalena Bay, in addition to traveling 350 miles up the west coast. The locality given as the source of his material is Cape San Lucas, but according to Horn the specimens were probably really collected between San José del Cabo and La Paz.

1867, *W. M. Gabb*. Browne, 1887; Horn, 1894:302; Nelson, 1921:141.

W. M. Gabb, a member of the J. Ross Brown expedition which explored the peninsula in the interest of a colonization company, collected a small number of insects as well as other natural history specimens. The party traveled north overland from Cape San Lucas to Tijuana. No locality data were given for the specimens collected.

1888-1894, *The California Academy of Sciences Expeditions*. Eisen, 1895; Nelson, 1921:143-145.

The California Academy of Sciences early recognized the need for further collecting in Lower California, and sent a number of expeditions into the

region between 1888 and 1894. The large number of insect specimens secured on these occasions has formed the basis for our knowledge of the nature of the fauna. As stated before, these collections were largely destroyed by the San Francisco earthquake and fire of 1906; however, many of the insect types were saved, and are preserved in the Entomological Museum of the California Academy of Sciences.

Eisen's summary of these expeditions (1895:753-754) is as follows:

"1. Expedition in March, 1888. W. E. Bryant. Magdalena Island, San Jorge to Comondu and across the peninsula to La Giganta and Loreto. Back by La Giganta, San Gabriel, San Juan. Back through Comondu.

"2. Expedition spring of 1889. W. E. Bryant and Chas. D. Haines. Magdalena Island, Santa Margarita Island, San Jorge, Comondu, from there overland to San Gregorio, San Ignacio, Calmalli, San Borgia, El Rosario, San Quintin.

"3. Expedition September and October, 1890. W. E. Bryant. San José del Cabo, Agua Caliente, Sierra, Triunfo, La Paz.

"4. Expedition March to May, 1892. W. E. Bryant, Gustav Eisen. San José del Cabo, Miraflores, Agua Caliente, Santiago, Gulf Shore, Sierra Laguna, San Francisquito, La Paz, Espiritu Santo Island, Guaymas, Sonora, Hermosillo, Durasnillas, San Miguel.

"5. Expedition September and October, 1893. Gustav Eisen. San José del Cabo, Sierra El Taste, across to Pescadero and Todos Santos, Cabo San Lucas, and back to San José, Miraflores, San Francisquito, Sierra Laguna, Todos Santos.

"6. Expedition September, October, November, 1894. Gustav Eisen, Frank H. Vaslit. San José del Cabo, Miraflores, Santa Anita, La Palma, Sierra San Lazaro, El Taste, Piedra Corral. Overland from San José to La Paz by Santiago, San Bartolo, Triunfo, La Paz. Mazatlan by steamer to San Blas. Overland to Tepic, by land to Mazatlan, via Santiago Ixtuintla, Squinapa, El Rosario, etc."

No entomologist accompanied any of the above expeditions, and insects were perhaps collected incidental to other Natural History objects. The most important collection of insects was made during the expedition of 1894.

Many groups of the insects obtained were reported upon in the Proceedings of the California Academy of Sciences, particularly in the 1894 and 1895 volumes.

1901, *Gustav Beyer*. Information is based upon excerpts from Beyer's Lower California letters kindly furnished by his daughter, Miss Ella A. Beyer. These have been placed in the historical file of the Pacific Coast Entomological Society.

Between February 7, and October 29, 1901, Gustav Beyer, then 61 years old, made a trip alone into the southern parts of the Cape Region for the purpose of collecting Coleoptera. His specimens have since become widely distributed in collections throughout the United States, and many new species have been brought to light as a result.

According to his letters he had the misfortune to be present in the region during a prolonged dry period, and as a result his collecting was generally poor. His travels were restricted to but a small area of the Cape Region in the vicinity of San José del Cabo, where he stayed at various ranchos, the names

of which he often used on his labels. Some of the localities he visited were San José del Cabo, Santa Rosa, San Felipe and El Taste.

1905-1906, California Academy of Sciences Expedition to the Galapagos Islands. Nelson, 1921 :144 ; Slevin, 1931.

During the southward voyage, the Schooner "Academy" stopped at Enseñada, and on San Martin, San Geronimo, San Benito, Cedros and Natividad Islands lying off the western shores of the peninsula. During these stops Mr. F. X. Williams, the entomologist, collected a number of insect specimens.

1911, U. S. S. "Albatross" Expedition of the American Museum of Natural History. Townsend (1916) ; Grossbeck (1912).

This expedition secured a small collection of insects in the Cape Region. These are listed by Grossbeck (1912).

1919, G. F. Ferris and J. R. Slevin. Ferris, 1920, 1921.

This party spent nearly two months in the Cape Region during July and August of 1919, traveling by means of riding animals and pack mules. The season was rainy, and the following are some of the localities visited : La Paz, San Pedro, El Triunfo, Santiago, Eureka Ranch, San Bartolo, Miraflores, San José del Cabo, Cape San Lucas, Todos Santos and La Laguna.

Professor Ferris devoted most of his time to the collecting of scale insects and did very little general collecting. This collection is deposited in the Stanford University Natural History Museum. Mr. Slevin collected reptiles for the California Academy of Sciences.

1921, Expedition of the California Academy of Sciences to the Gulf of California. J. R. Slevin (1923).

The primary aim of this expedition was to collect on the islands of the Gulf of California ; however, a few short stops made on the shores of the peninsula and on the mainland of Mexico. The insects were collected by Mr. E. P. Van Duzee and Mr. J. C. Chamberlain, and are now a part of the collection of the California Academy of Sciences.

A full account of this expedition has been written by Mr. J. R. Slevin (1923), and many of the insects have been reported in the Proceedings of the California Academy of Sciences (volumes of 1923 and 1924 primarily).

1923, Wm. M. Mann (1924).

Dr. Mann made a number of trips into Lower California studying insect pests of fruit for the United States Department of Agriculture. Two trips were made by burro between Loreto and La Purisima, during which insects were collected along the trail. He also collected at Santa Rosalia and in the vicinity of La Paz.

Most of the specimens according to Mann (in litt.) are still unidentified, and are in the United States National Museum.

1925, *California Academy of Sciences Expedition to the Revillagigedo Islands*.
G. Dallas Hanna (1926).

Although the object of this expedition was to collect scientific data and specimens on the Revillagigedo Islands, and secondarily on the Tres Marias Islands, several short stops were made at points on the peninsula of Lower California and on the islands off its western shore. At these opportunities Mr. H. H. Keifer, the entomologist of the expedition, secured entomological material.

These stops were as follows: April 19-22, Guadalupe Island; May 28, Cape San Lucas, "about a two-hour stop"; May 29, 30, Magdalena Bay, "rain of recent date"; June 1-3, San Bartolome Bay, "excessive aridity"; June 3-6, Cedros Island, "collecting good"; June 7, 8, San Quintin Point; June 8, San Martin Island, "numerous insects and spiders were taken."

For a detailed account of this expedition, particularly of its work on the Revillagigedo and Tres Marias Islands, the insects of which are reported in the appendices of the reports on each group of this series, the reader is referred to Dr. Hanna's account (1926).

1928, *T. Craig*.

During February and March of 1928 Mr. Craig visited a number of points along the shore of Lower California, Sonora, and several adjacent islands. His collections for the most part consist of Lepidoptera and have been presented to the California Academy of Sciences.

He collected at the following localities: *Lower California*, Cape San Lucas, El Tule Ranch, La Paz, Porto Escondido, Muertos Bay, Santa Maria Bay, Espiritu Santo Island; *Sonora*, San Pedro Bay; *Revillagigedo Islands*, Clarion Island; Socorro Island.

1930, *The Newbold-Morris Expedition*.

Mr. Clement B. Newbold and Mr. Bingham W. Morris made an overland collecting trip throughout the length of Lower California from February 10th to April 3rd, 1930. According to Hebard (1931), the expedition secured an interesting collection of Orthoptera.

1934, *G. F. Ferris*.

Traveling overland by automobile, Professor Ferris and Mrs. Ferris accompanied Dr. Forrest Shreve and T. D. Mallery of the Desert Laboratory of the Carnegie Institution of Washington. The party traveled south from Tijuana to Concepcion Bay, thence back to Santa Rosalia, and by boat across the Gulf to Guaymas, where they drove north through Sonora to Nogales, Arizona.

Professor Ferris collected only scale insects. The other members of the party were on a botanical expedition. The season was very dry.

1938, *Michelbacher-Ross Expedition.*

During the summer of 1938, between June 10th and August 15th, an expedition overland from Tijuana to Cape San Lucas and return was made with the express purpose of collecting as thoroughly as possible in a limited time the insect fauna of the peninsula. The collection thus secured has largely formed the basis for the present series of reports.

The party consisted of Dr. A. E. Michelbacher and Mr. E. S. Ross of the University of California and Mrs. A. E. Michelbacher of the California State Department of Health. The members of this expedition are grateful to officials of the University of California, the Fish and Game Commission of Mexico and the Automobile Club of Southern California for their coöperation in making this venture possible.

The expedition traveled by automobile, using a half-ton 1931 Model A Ford panel truck, often carrying large supplies of food, gasoline and water to traverse sparsely inhabited areas. The road south of Santo Tomas (30 miles south of Ensenada) to the Cape, as expected, proved to be very poor and almost impassable in many places. However, for properly equipped expeditions with sufficient time to travel slowly, the trip is quite feasible.

Nearly fifty, generally different, camps were made, where possible in the most promising spots for collecting throughout the length of the peninsula. The average day's collecting routine consisted of arising early in the morning to "beat" and otherwise to search for insects until about 10 a.m., at which time camp was broken. The time from 10 a.m. until 4 or 5 in the afternoon was devoted to travel and to numerous short collecting stops along the road. Generally only 50 miles were covered in this time. Camp then would be made and collecting would commence at once and continue until almost dark. At this time the gasoline lanterns would be lighted, one of these remaining stationary in a favorable spot to attract night-flying insects, the other being carried by a member of the party to illuminate the "night beating" of a companion. Often the lanterns were also used to search the ground and vegetation for crawling nocturnal insects so prevalent in such desert regions. By such a division of labor the size of the collection obtained was greatly increased. The day's collecting would be discontinued at 11 p.m. or later depending upon the abundance of the insects in the area.

Approximately 50,000 specimens of insects were collected in the course of this expedition, many of which were secured in localities never before visited by entomologists.

Much of the mounting and labelling of the specimens obtained was accomplished through the assistance of the National Youth Administration and Work Projects Administration.

Owing to the large number of collecting stops, these and the conditions observed can be but briefly summarized as follows according to the general geographic area in which they were located. The titles here used are not to be considered indicative of natural faunal areas in every case.

I. Northwest Pacific Coastal Area between Tijuana and Rosario.

The biota and climate of this region are quite similar to that of coastal San Diego County, California. It is a region of very frequent fog and scanty winter rains. At the time of the expedition's visit in the area conditions were far past their prime, and as a result collecting in general was poor. The region should be visited during the spring for the best collecting.

The camps made in this area are listed as follows:

1. Rosarito Beach, June 13, August 4. Very dry; poor collecting.
2. 17 miles south of Enseñada, June 14. Watered arroyo; fair aquatic and night collecting.
3. 20 miles south of Santos Tomas, August 3. Small, well-watered, foothill valley with dense, riparian vegetation.
4. Rio San Telmo (mouth), June 15. Very cold and foggy; little collecting.
5. Hamilton Ranch, August 2. Broad, sandy arroyo, abundant streamside vegetation.
6. Socorro, June 16. Cold and foggy; no collecting.
7. 15 miles north of Rosario, August 1. Beach; collecting under seaweed good.

Of the many stops en route, one deserves particular mention, that being the one made on the broad plain near San Quintin on August 2, where collecting was good on the varied plants growing thereabout.

II. The Arid, Central Mountainous Plateau Region between Rosario and Punta Prieta.

In the rocky hills east of Rosario the flora suddenly takes on a new aspect. *Idria columnaris* and *Pachycereus pringlei* and many species of cacti dominate the scene. In the plateau region about El Marmol the vegetation is scanty and conditions in many respects seem to represent a southern continuation of the Colorado Desert of California. Near Catavina a granitic formation is exposed which produces a very rough, boulder-covered terrain upon which grow numerous *Pachycereus*, *Idria*, *Pachycormus discolor*, *Opuntia*, *Fouquieria splendens*, etc., and in certain arroyos fan palms of the genera *Washingtonia* and *Glaucotea* are abundant.

Dense growths of *Yucca valida* are seen on the sandy plain bordering the northwestern base of the Sierra San Borjas. On the alluvial gravel plains, north of and about Punta Prieta, the *Pachycormus* which were in bloom are particularly abundant.

This last mentioned region in spite of its rich flora is extremely arid and the vegetation seems to be highly adapted to such conditions.

Camps were made in this area as follows:

1. 18 miles east of Rosario, June 17. Poor collecting, due to cold, foggy night.
2. San Fernando, July 30. Marshy, alkali valley surrounded by extreme desert hills.
3. 7 miles south of El Marmol, June 18. Cool night; good beating on cat-claw and mesquite.
4. Catavina, June 19. Wet arroyo; variety of conditions; fair collecting.
5. 10 miles south of Catavina, July 29. Arroyo; fair "light collecting."
6. Chapala Dry Lake, June 20. Very dry; good beating on mesquite.
7. 15 miles north of Punta Prieta, July 28. Dry; good night collecting.
8. 10 miles south of Punta Prieta, June 21. Broad, dry valley; dense large mesquite grove.

III. The Foggy Pacific Coast Desert.

The immediate coastal plain in this area is very desolate. The plants near the shore, *Pachycormus*, *Fouquieria peninsularis*, etc., are much stunted and gnarled by wind and covered with dense epiphytic growths. For many miles inland the foggy conditions continue to produce perhaps even more extensive such growths on the desert plants and rocks. The climate is characterized by nearly perpetual fogs which during the night may drift inland to the mountains. These probably prevail throughout much of the length of the northern half of the Pacific coast.

About Mesquital the *Yucca valida* attain huge proportions, some specimens being nearly 15 feet high and of equal extent. These bore numerous large blossoming heads.

Insect collecting in this area proved to be poor. Several stops were made during the daytime en route, and two camps were made at Mesquital, June 22 and July 27, with but fair collecting success.

IV. The Vizcaino Desert.

The road passes along the eastern portion of this, the largest desert in Lower California.

The flora proved to be richer than might be expected, and many plants found commonly much farther to the south were seen here for the first time. *Pachycereus*, *Agave* and *Yucca valida* are common in the northern part, the first mentioned being particularly large and dense just south of Mesquital. Several areas were collected which had received relatively recent water, and the resultant growth of annuals was very profuse. A corresponding increase in the animal life was also noted. A number of rocky arroyos toward the southern extremity of the desert showed evidences of great floods originating in the rugged mountains to the east. These as a result possessed plant life rich in species.

Camps were located as follows :

1. 14 miles south of the El Arco Mine, June 23. An area that had been flooded during the past season ; spiny poppies very large ; mesquite in full bloom.

2. 45 miles north of San Ignacio, July 26. Near an arroyo ; night-collecting good, rain threatening.

3. 15 miles north of San Ignacio, June 24 and July 25. In a rocky arroyo which had recently carried water ; collecting good.

V. The South-Central, Rocky, Volcanic Mountain Region.

The mountains of this region, of which the Sierra Giganta constitutes the dominant range, consist largely of volcanic rocks. The rough basaltic rock which is present supports rather scattered vegetation, most of the species of which occur on a larger scale in the Cape Region. Several deep gorges are present which possess large springs making possible considerable agriculture such as at San Ignacio in the north, and Comondu and La Purisima farther south. Perhaps due to the replacement of the native flora in these places by

cultivated plants such as date palms, sugar cane, corn, grapes, figs, mangoes, etc., collecting proved to be very poor. High in the mountains north of Comondu several lagoons of fresh water were present, the surrounding native flora of which provided good collecting.

Some of the common plants of this region are *Elaphrium*, *Jatropha*, *Cercidium*, *Prosopis*, *Lysiloma candida*, *Lemaireocereus thurberi*, *Salix*, *Pachycereus*, *Opuntia* and *Ficus palmeri*.

This region, of course, receives more rain than the surrounding desert, but much less and more sporadic than that of the Cape Region. During the trip south no rain of appreciable amount had fallen where the expedition passed, but showers were seen in the distance on many sides. However, before the return journey considerable rain had fallen along the road, and its effect on the vegetation and insects was noticeable. These rains are often localized, and although one area may receive abundant rain, a neighboring locality may fail to have rain even for a series of years in succession.

Most of the arroyos of these mountains drain toward the west as the mountains, like the Sierra Nevada of California and most other ranges of Lower California, rise abruptly on the east and slope gently westward.

Camps in this area were located as follows :

1. San Ignacio, June 25. Agricultural area ; poor collecting.
2. 25 miles west of Santa Rosalia, June 26. At base of one of the Tres Virgines volcanoes. Very arid ; vegetation sparse ; collecting poor.
3. 20 miles north of Comondu, July 1 (no camp), and July 23. Fresh water lagoons ; excellent collecting.
4. Comondu, July 21, 22. Agricultural area ; fair collecting.
5. San Miguel, July 2. Conditions similar to above.
6. 5 miles west of San Miguel, July 20. In a deep gorge ; vegetation large, but no rain in several years ; collecting poor.
7. 20 miles west of La Paz, July 16 } Northern extension of Cape Region
8. 15 miles west of La Paz, July 4 } flora ; very dry, collecting fair.

VI. The Shores of the Gulf of California.

The region bordering the west shore of the gulf is very arid. In most spots the shores are alkaline and support salt marsh vegetation. Mangrove trees are common south of Santa Rosalia, bordering and growing in the frequent salt water lagoons and estuaries. The blossoms of these attracted many insects. On the very dry, rough rocky slopes behind the shore a sparse vegetation dominated by cacti is present.

Littoral collecting was good, but the almost complete absence of seaweed on the beaches reduces the fauna considerably.

Collections were made at the following camps :

1. 12 miles south of Santa Rosalia, June 27 (near San Bruno). Fair collecting.
2. 25 miles south of Santa Rosalia, July 25. Well inland next to a broad arroyo ; recent rain.
3. Coyote Cove, Concepcion Bay, June 28, 29, 30 ; July 24. Collecting good on mangrove blossoms only.
4. La Paz, July 16. Brief littoral collecting (no camp).
5. Buena Vista, July 7. (Cape Region) very poor (no camp)

VII. The Magdalena Plain.

This low, silty plain gently sloping westward has apparently resulted from the deposition of sand and silt from the mountains to the east. There are indications that until recent geological times it was beneath the sea, and therefore the biota it supports has moved on to it later from neighboring residual areas. The Magdalena Bay is undoubtedly a remnant of this encroachment of the sea, and the islands along its western margin, the Santa Margarita and Santa Magdalena Islands, which are mountainous and composed largely of Pre-Cretaceous schists (Darton, 1921), were probably once more widely separated from the mainland.

Fouquieria peninsularis with its covering of *Orchilla* is the dominant plant amid which grow cacti: *Pachycereus*, *Lemaireocereus gummosus* and *eruca* (the latter very localized about San Domingo), numerous *Opuntia*, *Echinocereus* and *Lophocereus*.

A number of large arroyos originating in the sierra to the east cross the plain, along which there are dense growths of mesquite. A characteristic feature of the plain is the very numerous, shallow, dry lake beds which are generally devoid of vegetation. No recent rain had fallen at the time visited, but during the return trip the clouds were threatening and a few drops of rain fell. Sporadic occurrences of parched grass indicated the presence of appreciable rain, perhaps during the previous year. In such spots collecting was very good.

Principal collections were made at the following localities:

1. San Domingo, July 19. Large, mesquite-bordered arroyo; very dry but collecting excellent.
2. 15 miles north of El Refugio, July 3. Another such arroyo; parched grass present, very dry but collecting excellent.
3. Magdalena Bay, July 18 (south of Medano Amarillo). Beach near mangroves; littoral collecting good; rain threatening.
4. Venancio, July 17. Large arroyo; very dry; collecting good.

VIII. The Cape Region.

This famous region, which until recent geological time was separated from the rest of the peninsula as an island, possesses the richest and best known fauna and flora of Lower California. Eisen (1895) gives a vivid description of this region.

The rains are of more or less regular occurrence and generally come in the summer months. Rains had already commenced a few weeks prior to the arrival of the party in the region early in July. The countryside showed evidences of its variable amount and of time interval in the various shades of green of the vegetation covering the mountains. The earliest and greatest amount of rain had evidently fallen in the vicinity of Miraflores, for the vegetation there was much more advanced than elsewhere visited. The general conditions encountered were comparable to very early spring in temperate regions, and

most of the insects collected were probably representatives of the brood that had survived the long dry season. It was too early to have had the opportunity of collecting the more populous later generations.

Collections were made chiefly at the following points:

1. 3 miles north of San Pedro, July 5. Very recent rain.
2. 6 miles north of Triunfo, July 15. Recent rain.
3. Triunfo, July 6, 13, 14. Spring-like conditions; collecting good.
4. 5 miles north of San Bartolo, July 12. Early effect of rain.
5. Santiago, July 7. Near small area recently cleared of brush; dry.
6. Miraflores, July 8. (Boca de Sierra). Dense jungle-like growth.
7. 10 miles south of Miraflores, July 11. Excellent collecting.
8. 10 miles west of San José del Cabo, July 9. (Near coast). Very dry; poor collecting.
9. 8 miles east of Cape San Lucas, July 10. At beach, dry.
10. Todos Santos, July 15. (No camp). Very dry, but collecting fair.

In addition to the above, numerous stops were made along the road; collecting was found to be particularly good in rotting *Elaphrium* and *Pachycereus* and at lights.

1938-1939, Rindge Expeditions.

Two expeditions traveling entirely by boat, the yacht "*Samona II*," were made by the Rindge family, during which Lepidoptera were collected. The first began in mid-December, and lasted until early January of 1939. Fred H. Rindge and Mr. and Mrs. Samuel H. Rindge acted as collectors. The peninsular localities collected were: San Lucas Bay (best collecting), Los Frailes Bay, Pulpito Bay, San Marte Bay, Puerto Escondido, Las Animas Bay, Muertos Bay. The gulf islands visited were San José Island (Armortajada Bay and north end) and Tiburon Island (Monument Bay). Stops were also made in Sonora at San Pedro Bay, San Carlos Bay and Guaymas.

The second trip, with Mr. and Mrs. S. K. Rindge and Capt. W. B. Studley as collectors, was made during April and May of 1939. The only Lower California stops were at San Lucas and Muertos Bays, where conditions were found to be too dry for good collecting. Other collections were made in the states of Guerrero, Jalisco and Sinaloa on the Mexican mainland.

1939, Mexicali to San Felipe.

The region south of Mexicali for many miles is rich irrigated farm land, a southern extension of that of the Imperial Valley of California. As expected, the insect fauna is also similar.

Farther south, near Hardy's Colorado River at El Mayor, very dense growths of mesquite are present, with an abrupt narrow fringe of *Salix*, etc., bordering the river. To the west the Sierra de los Cucopahs rise, very rocky and almost bare of vegetation.

South of El Mayor a 40-mile strip of bare, salt flat, bordered to the west by the Sierra Pinta, is present which is frequently flooded by the high tides of the head of the Gulf of California. Recently these tides have made their way

many miles farther inland, and as a result acres of mesquite have died due to salt-water flooding.

Near San Felipe the land is more elevated and consists of gravel and sand. Many southern species of plants are present in spite of the great aridity.

Two short trips were made into this region in 1939; the first by E. S. Ross and C. D. Michener in early April. Collections were made 20 miles south of Palacio, near El Mayor and 20 miles west of Mexicali. The party could not proceed very far south of El Mayor because of the then-impassable muddy salt flat. During this same trip two stops were made on the Pacific coast at Rosarito Beach south of Tijuana.

The second trip was made by E. S. Ross and R. Folsom in late June. Collections were made in the agricultural area south of Mexicali and in the vicinity of San Felipe. Collecting was particularly good on the beach at this point under numerous large, dead fish left by fishermen.

1941, California Academy of Sciences Expedition to Lower California.

Between September 19 and November 5, 1941, an expedition from the California Academy of Sciences collected insects and plants in Lower California. Insects were collected by Dr. E. S. Ross and Mr. G. E. Bohart and the plants by Miss B. J. Hammerly. Also in the party were Mrs. Berta Jongeneel and Mr. Morton Gleason, Jr.

The above group traveled overland in a one and one-half-ton truck and collected at many of the localities visited by the Michelbacher-Ross expedition of 1938. At this time of year, however, the mountains and much of the lowlands from Santa Rosalia to Cape San Lucas showed the benefit of an abundance of late summer rain. The trees and shrubs were in full leaf and the ground often covered with grass and blossoming annuals. As a result the collection obtained is rich in flower-visiting Diptera and Hymenoptera. Cool nights and the late season seemed to limit the number of insects attracted to the lights, but nevertheless an excellent collection of moths was thus obtained.

A side trip was made by mule from Todos Santos to La Laguna in the Sierra Laguna. The collection of insects made in this region with its isolated association of pine, oak and madrone should prove to be particularly interesting.

* * * * *

In addition to the above, the G. Allan Hancock Expeditions should be mentioned; these which commenced in 1934 and have continued annually since, have secured numbers of important insect specimens in and about Lower California.

SELECTED BIBLIOGRAPHY

AUTOMOBILE CLUB OF SOUTHERN CALIFORNIA

1934. Log of the Peninsula of Lower California and the Gulf of California. Outing Bureau Auto. Club S. Calif., Los Angeles, California, 23 pp., map.
1939. Revised edition.

BROWNE, J. R., et al.

1887. Resources of the Pacific Slope. Pp. 1-678; 1-200, New York.

BRYANT, W. E.

1891. The Cape region of Lower California. *Zoe*, 2:185-201.

DARTON, N. H.

1921. Geological Reconnaissance in Baja California. *Journ. Geol.*, 29:721-748.

EISEN, G.

1895. Explorations in the Cape Region of Baja California in 1894, with references to former Expeditions of the California Academy of Sciences. *Proc. Calif. Acad. Sci.* (2) 5:733-775, pl. 72-75, maps.

EMMONS, S. F., and MERRILL, G. P.

1894. A geological sketch of Lower California. *Bull. Geol. Soc. Amer.*, 5:489-515.

FERRIS, G. F.

1920. Insects of economic importance in the Cape Region of Lower California, Mexico. *Journ. Econ. Ent.*, 13:463-467.
1921. Report on a collection of Coccidae from Lower California. Stanford Univ. Publ., Univ., Series, Biol. Sci., 1: pt. 2:61-132, 52 figs.

GOLDMAN, E. A.

1916. Plant records of an expedition to Lower California. *Contr. U. S. Nat. Herbarium*, 16(14):309-371, I-XIII, pl. 104-133, map.

GROSSBECK, J. A.

1912. List of insects collected by the *Albatross* Expedition in Lower California in 1911, with description of a new species of wasp. *Bull. Amer. Mus. Nat. Hist.* 31:323-326.

HEBARD, M.

1931. Studies in Lower California Orthoptera. *Trans. Amer. Ent. Soc.*, 57:113-127, pl. 22.

HANNA, G. D.

1926. Expedition to the Revillagigedo Islands, Mexico, in 1925—general report. *Proc. Calif. Acad. Sci.* (4) 15:1-94, pl. 1-10.

HORN, G. H.

1894. The Coleoptera of Baja California (I). *Proc. Calif. Acad. Sci.* (2) 4:302-449, pl.

MANN, WM. M.

1924. Myrmecophiles from the western United States and Lower California. *Ann. Ent. Soc. Amer.* 17:87-95, figs.

NELSON, E. W.

1885. Natural history of the Tres Marias Islands. U.S.D.A. Biol. Survey 1885, N. A. Fauna No. 14.
1911. A land of drought and desert—Lower California. *National Geogr. Mag.* 22:443-474, 28 ill.
1921. Lower California and its natural resources. *Mem. Nat. Acad. Sci.* 16:1-194, pl. 1-35. (Excellent treatise and complete bibliography.)

SCHMIDT, K. P.

1922. The amphibians and reptiles of Lower California and the neighboring islands. Bull. Amer. Mus. Nat. Hist. 46:607-707, figs.

SLEVIN, J. R.

1923. Expedition of the California Academy of Sciences to the Gulf of California in 1921—General Account. Proc. Calif. Acad. Sci. (4) 12:55-72, map.
1931. Log of the Schooner "*Academy*." A voyage of scientific research to the Galapagos Islands 1905-1906. Occ. papers Calif. Acad. Sci. 17:1-162, 16 pl., map.

STREETS, T. H.

1877. Contributions to the natural history of the Hawaiian and Fanning Islands and Lower California. Bull. U. S. Nat. Mus. No. 7:1-172.

TOWNSEND, C. H.

1916. Voyage of the *Albatross* to the Gulf of California in 1911. Bull. Amer. Mus. Nat. Hist. 35:399-476, figs. 1-45, map.

XANTUS, DE VESEY, J.

1860. Travel in the southern parts of California. Budapest; Lauffer and Stolp, Publishers.

EXPLANATION OF PLATES

PLATES 1-3

The maps on Plates 1-3 were prepared to indicate the principal localities in Lower California at which collections of insects have been made. Information has been freely compiled from many sources but principally from maps published as follows:

Eisen, Gustav, and F. H. Vasilit. 1895. Proc. Calif. Acad. Sci., (2) 5; Plates 72-75B.

Nelson, E. W. 1921. Mem. Nat. Acad. Sci., Vol. 16, 1st Memoir.
Slevin, J. R. 1923. Proc. Calif. Acad. Sci., (4) 12:55-72 (Map by G. D. Hanna).

Outing Map of Lower (Baja) California and the Gulf of California, Automobile Club of Southern California, Los Angeles, California.











